LATITUDE AND LONGITUDE

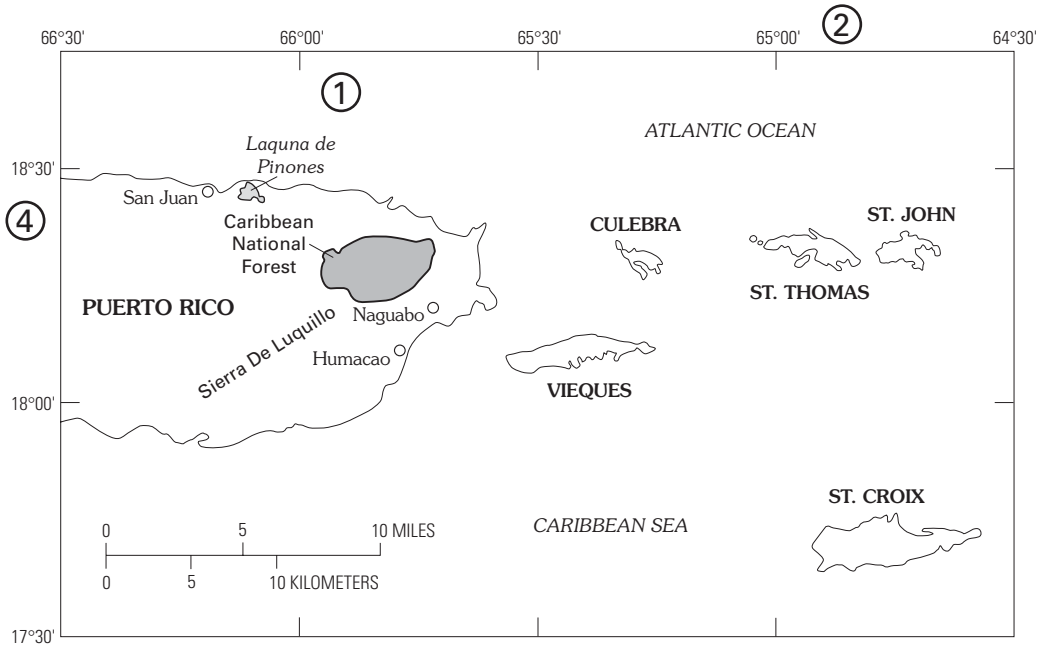
① Maps require latitude and longitude. Latitude and longitude ticks should be the same lineweight as the neatline (0.005 inch or 0.36 points). Tick length should be 0.1 inch for labeled ticks and 0.05 inch for unlabeled ticks. Always place ticks inside the neatline and on all four sides of the illustration.

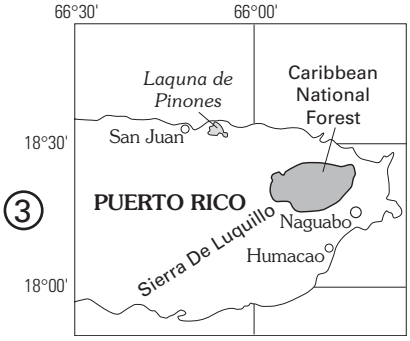
② Label latitude and longitude as **degree minute seconds**. For example: 36°15'30." Always label degree and minutes, but do not label 00 seconds.

The degree symbol (°) is typed by using: Option-Shift-8 (on the Macintosh).
Do not use "curly" minute and second symbols. If the type font gives "curly" symbols, use instead: Symbol font Option-4 for (′) minute and Symbol font Option-Comma for (″) second.

③ When lines of latitude and longitude are shown, a landmass should hide these lines. Lines of latitude and longitude can also be screened to 30% black for ease of reading.

④ Place labels outside neatline and centered on the ticks, approximately 0.033 inch from neatline. Label latitude and longitude along the top and left sides of page-size maps and illustrations. On larger maps, latitude and longitude is shown on all four sides. **Font**: Universe Light Condensed (ULC). **Size**: 7 to 8 point, depending on size of diagram.

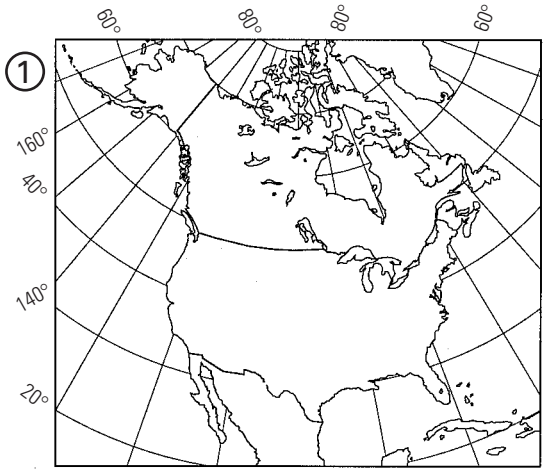


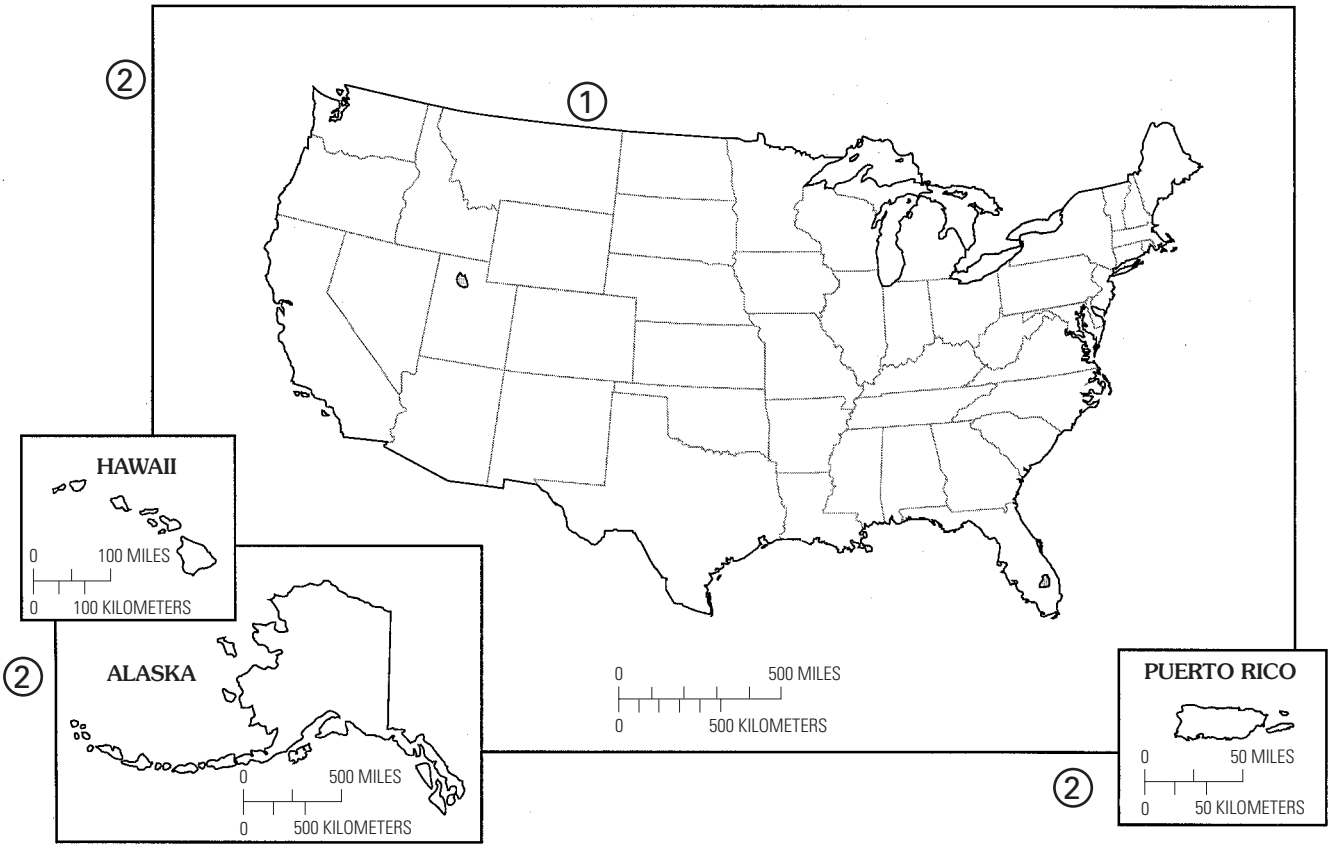


NEATLINES AND BORDERS

① Generally, neatlines should be thinner than borders. A neatline contains the body of a map. Neatlines on page-size maps should be 0.005 inch or 0.36 points, and solid black lines. Neatlines can be any shape.

② Borders should be a heavier lineweight than neatlines. Borders enclose a map and any map-related graphics or features that explain that map. A heavier lineweight, 0.008 inch or 0.576 points is required. Solid black lines are preferred. Use the heavier lineweight for inset maps.





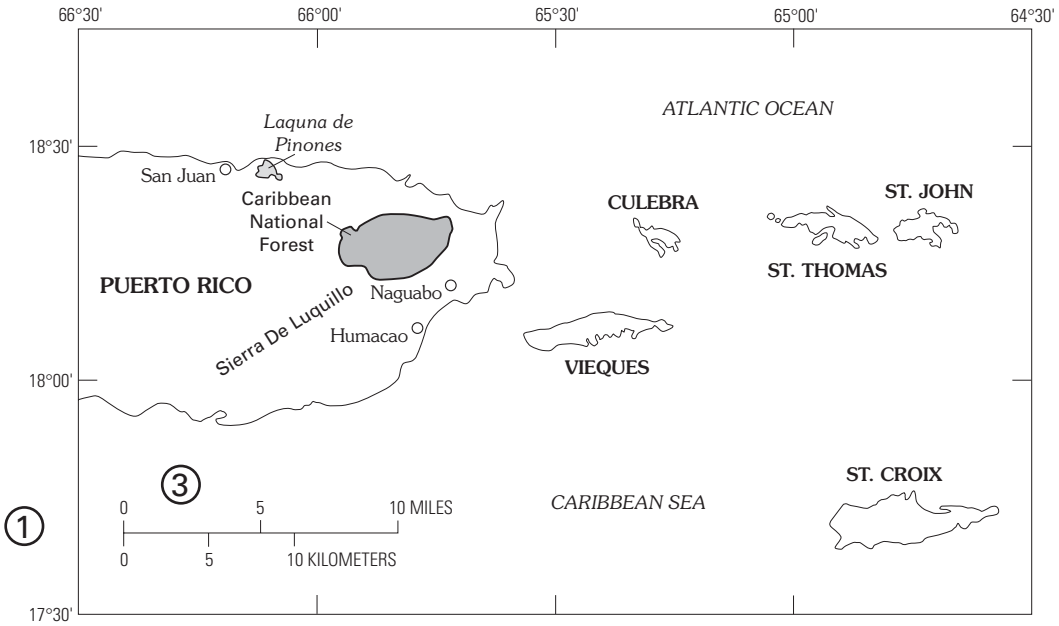
SCALES

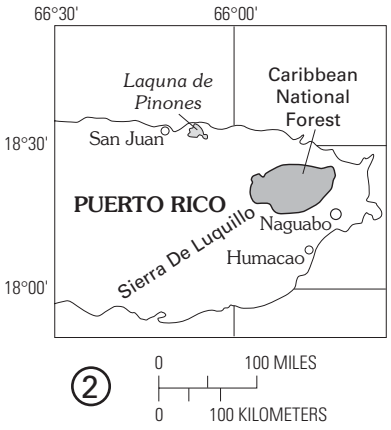
① Most maps require a scale. Page-size maps use a rake scale. Bar scales are reserved for use on plate-size maps. Lineweight should be 0.005 inch or 0.36 points. Tick lengths are 0.066 inches for numbered ticks and 0.033 inches for unnumbered ticks.

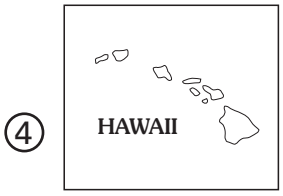
② All scales require dual units; English and metric. Use English measurements on the top and metric on the bottom; unless the illustration is published in metric, then show metric units on the top.
Font: Universe Light Condensed (ULC). **Size**: 8 point type on a full page or 7 point on a smaller map. Always type miles and kilometers in all capital letters. Miles and kilometers begin with 0 and end with the same value. Center the numbers over the ticks.

③ Scale length should not exceed one-third the length of the map. Preferred location for the scale is centered below the map, outside the neatline; otherwise, position scale for best fit, both for the illustration and for typesetting.

④ Scales are optional for location, inset, and index maps.







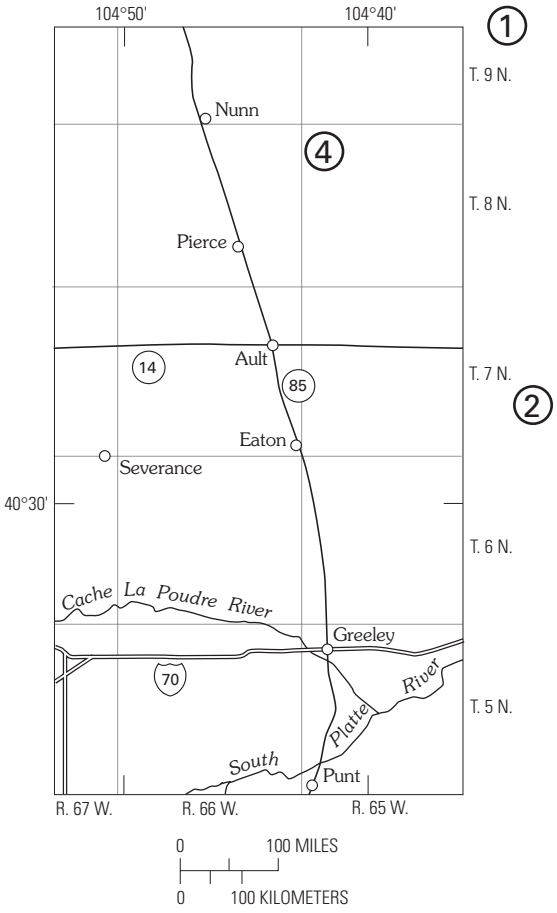
TOWNSHIP AND RANGE

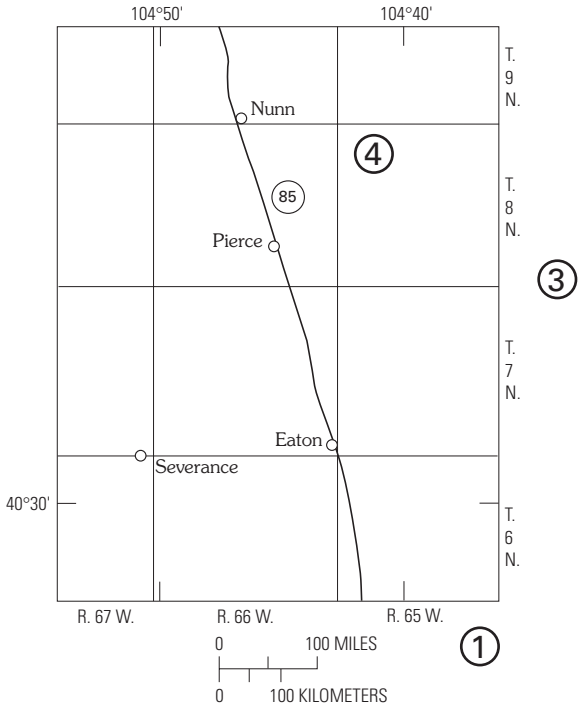
① When township and range are shown on page-sized maps, township should be located along the right side of illustration and range along the bottom. Use periods if labeled outside the neatline and no periods when labled inside the neatline.

② **Font**: Universe Light Condensed (ULC), all capital letters. **Size**: 7 point. Use periods after letters and one space in between letters and numbers.

③ Township values may be stacked when space is at a minimum; left justify. Do not stack Range designations.

④ Township and range lineweight is 0.005 inch or 0.36 point, solid black or screened 50% black.





EXPLANATIONS

① The word "EXPLANATION" is always used. It is positioned above the first line of the explanation block. **Font**: Souvenir Medium, all capital letters. **Size**: 7 or 8 point, depending on size of illustration and explanation.

② Distance between the word EXPLANATION and the first line of text may vary, but generally 0.075 inch.

③ If a subheading is required, place directly below EXPLANATION, centered, in Souvenir Light, 7 point, bracketed.

④ Text: **Font**: Souvenir Medium, caps and lowercase. **Size**: 7 or 8 point. Type size should match the size of the word EXPLANATION. Overruns are indented 2 em space (length of letters mm).

⑤ If text consists of an additional explanation, separate with a 1 em dash (—) (Option-Shift-Dash). Use Souvenir Light font and same size text.

⑥ Numbers in a range should use a 1 en dash (Option-Dash, on a Macintosh) instead of the word "to." EX: 5–15

⑦ Indentations, other than one-line overruns, can vary. Explanations within a report should be consistent.

⑧ Size of explanation boxes should be 0.45 x 0.25 inches (2p8.4 x 1p6 picas). Box size should be consistent throughout the report. Examples below are 0.45 x 0.25 inches.

⑨ Distance between explanation boxes will vary depending if the descriptive text for a particular box is one line or several lines. Be consistent throughout report.

⑩ Distance between explanation boxes and body text is 0.1 inch (0p10 picas).

⑪ Line length of linear symbols is 0.55 inch (3p4 picas). Align text with other explanation text.

⑫ Symbol size, shape, and color should be in accordance with *Public Review Draft—Digital Cartograhic Standard for Geologic Map Symbolization*, dated April 2000.

⑬ Location of explanation block is variable, but preferred location should be outside the illustration in upper right hand corner, if possible.

⑭ Order of explanation content should be area (boxes), line (faults, anticlines), point (well).

FOR EXAMPLES, SEE FOLLOWING PAGE (6)

EXPLANATION EXAMPLES

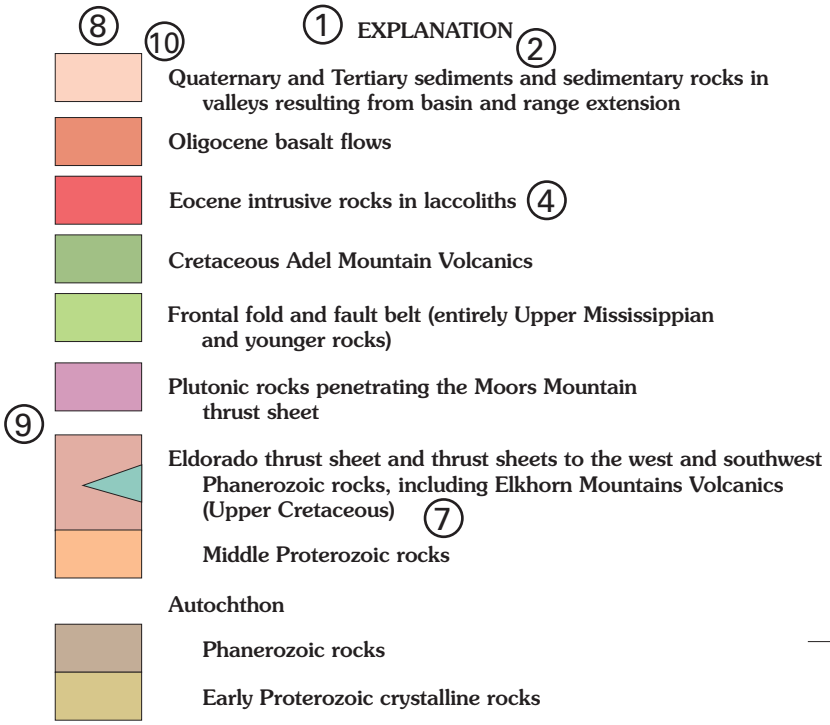
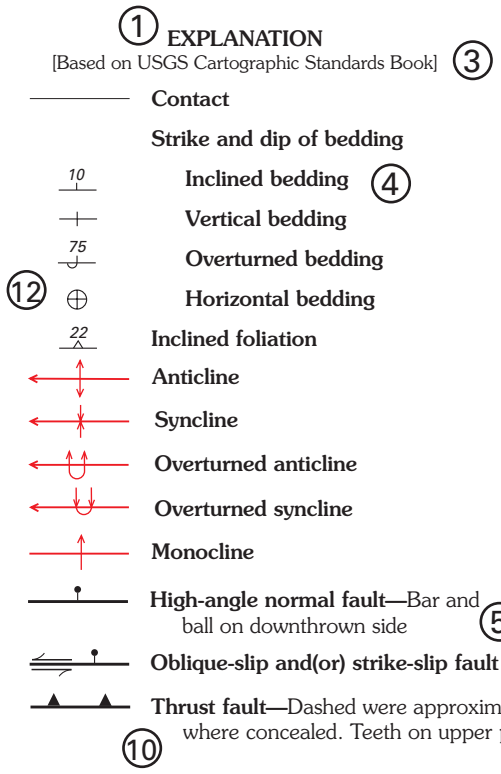
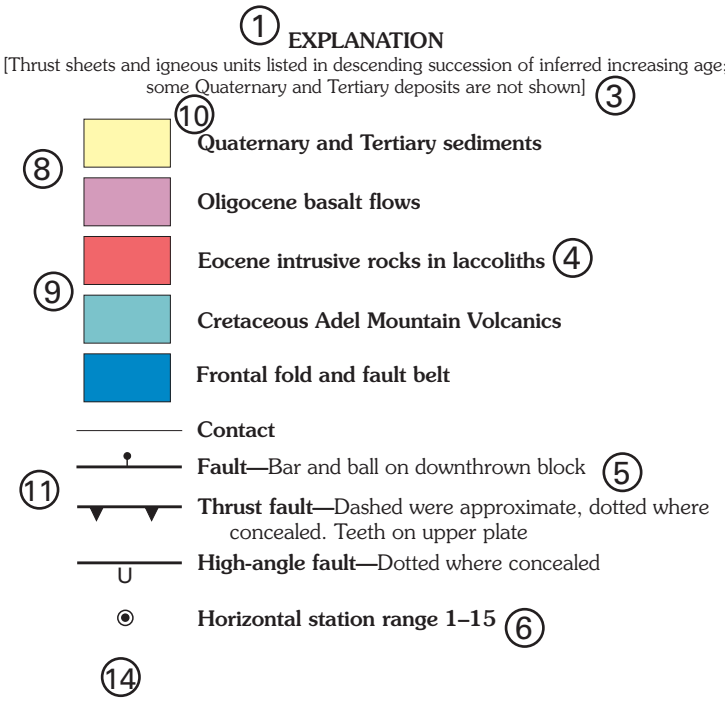


ILLUSTRATION AND EXPLANATION LOCATION EXAMPLE 13



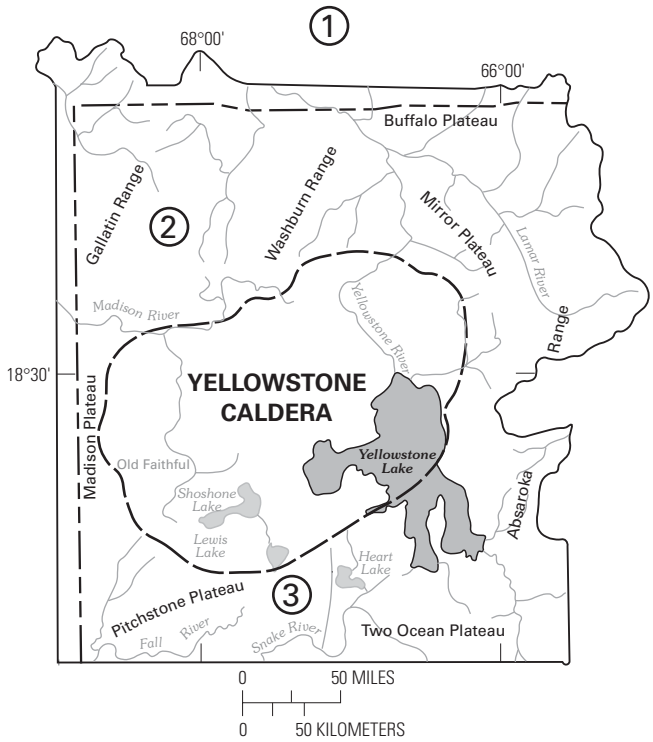


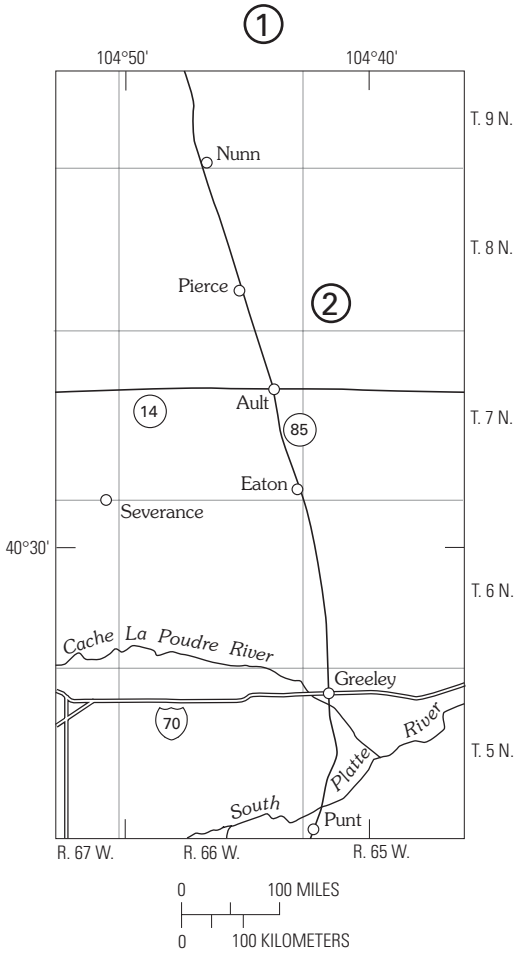
SCREENED BACKGROUNDS

① Screening of lineweights and type is sometimes necessary to provide more legibility to overcrowded maps and illustrations. Screening usually is applied to black lineweights and to black type. In general, begin screening with a value of 30–40%.

② Screen lineweights and accompanying type that is not the prominent feature on the map. For example, screen back rivers and river names, if roads, highways, and park boundaries are the prominent features to be displayed.

③ Excessive (greater than 50%) screening of text can cause illegibility.





GEOLOGIC CROSS SECTIONS

① Geologic cross sections depict geologic information about the land surface and subsurface along a vertical plane. A trace of a cross section (*A*–*A*') is located on a map. The trace of cross section may be one straight line or a series of short, zigzag-line segments; 0.36 points (0.005 inch), solid black. Letters *A*–*A*' are Souvenir Medium Italic, 11 point. Multiple cross sections will be labeled *B*–*B*', *C*–*C*', etc., with a 1 en dash separating letters. A cross section with a series of short-line segments will be labeled *A*–*A*" (For example: *A*–*A*'–*A*"). In general, label cross section traces by aligning letters to the plane or direction of line.

② Vertical axes are labeled outside the cross section with tick marks pointing outward, as well. Label both the left and right vertical axes. Label axes in Universe Light Condensed, 7 to 8 pt, depending on the size of cross section. Use comma's in four digit and larger numbers. Unit of measure should be shown at the top of the axes in capital letters.

③ If known, state vertical exaggeration below and outside the cross section in all capitals letters, Universe Light Condensed, 6 to 7 point. For example: VERTICAL EXAGGERATION × 8. If vertical exaggeration is not known, add NOT TO SCALE in lower left corner. The "×" is in Symbol font, Option y.

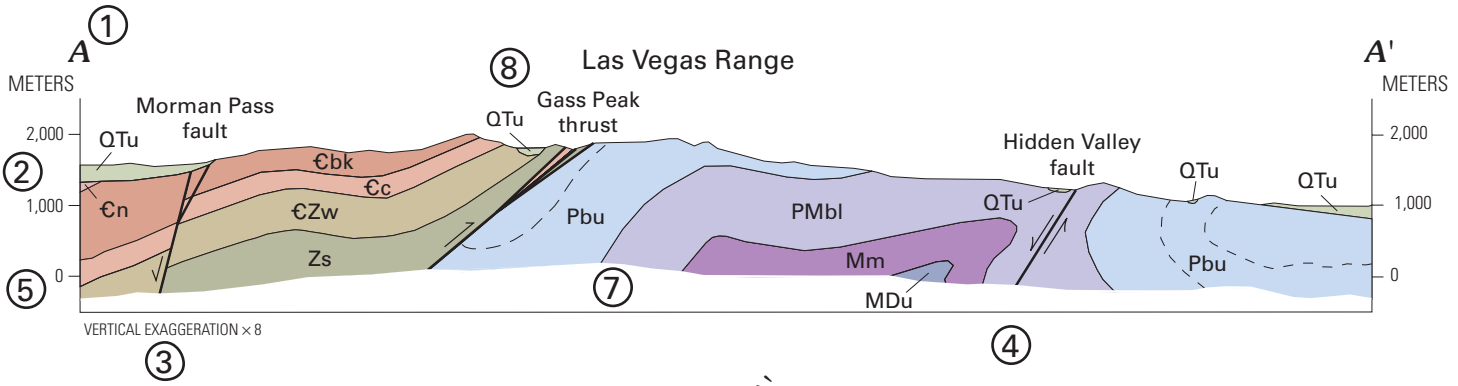
④ Horizontal axis should not have tick marks. A rake scale will be centered below and outside the cross section. Geologic cross sections placed on the same sheet as the geologic map, do not require a separate scale, as in the example below.

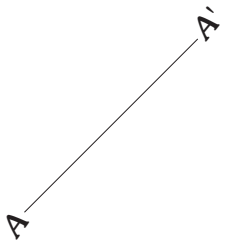
⑤ The vertical datum is indicated by a zero (0) and elevations below this point are listed as negative numbers. For example: -1,000.

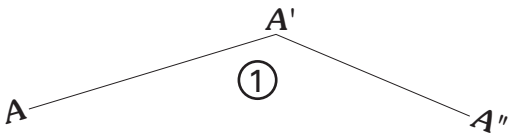
⑥ Geologic cross sections require an explanation to the section unless it is accompanying a map, then only one explanation is needed for both. (Explanation is not shown here due to limited space.)

⑦ Always enclose bottom of cross section with a line. Bottom of formations are shown as open areas because the formation continues on past the lowest vertical elevation.

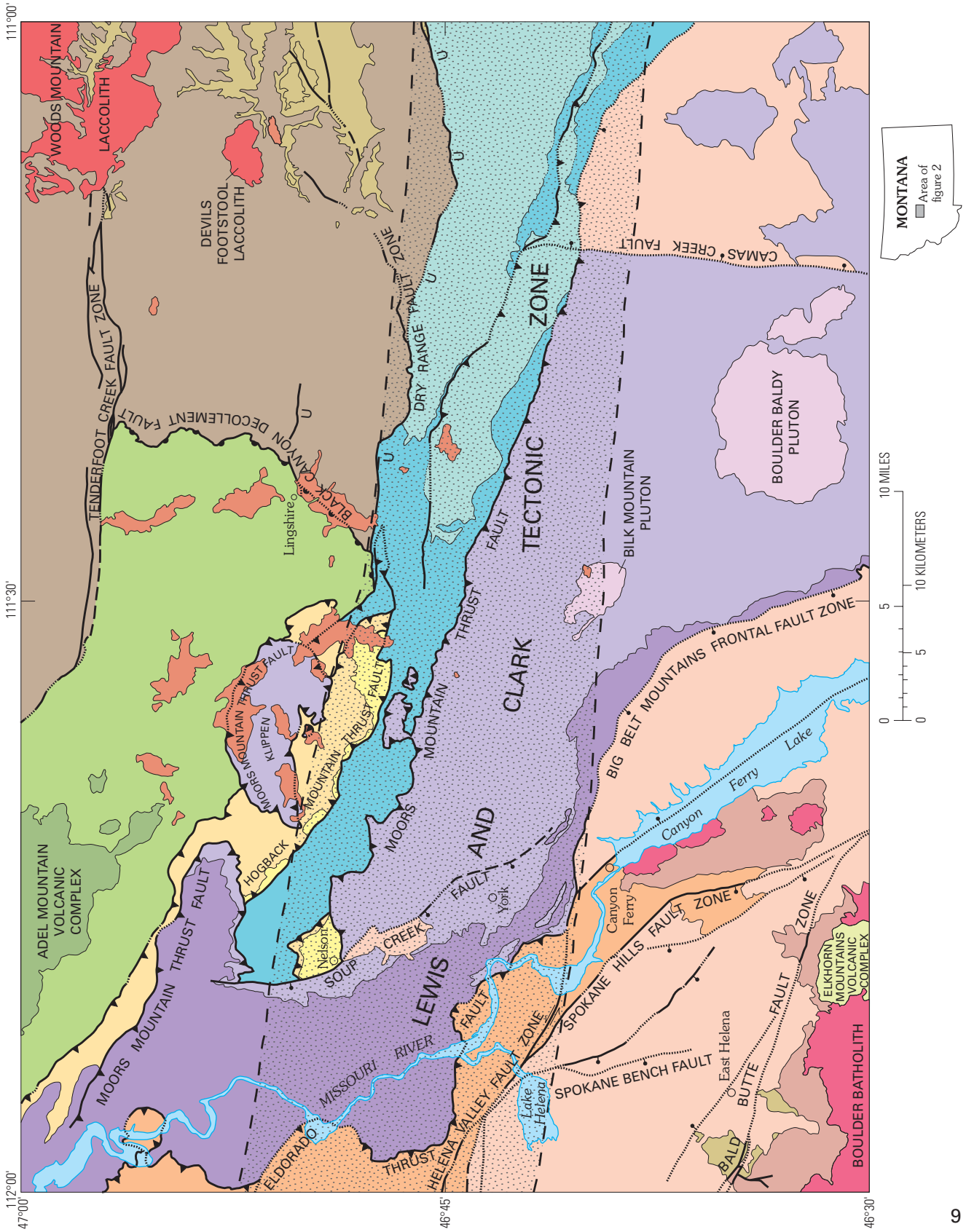
⑧ Type styles and lineweights on geologic cross sections should be the same as those used on the map.







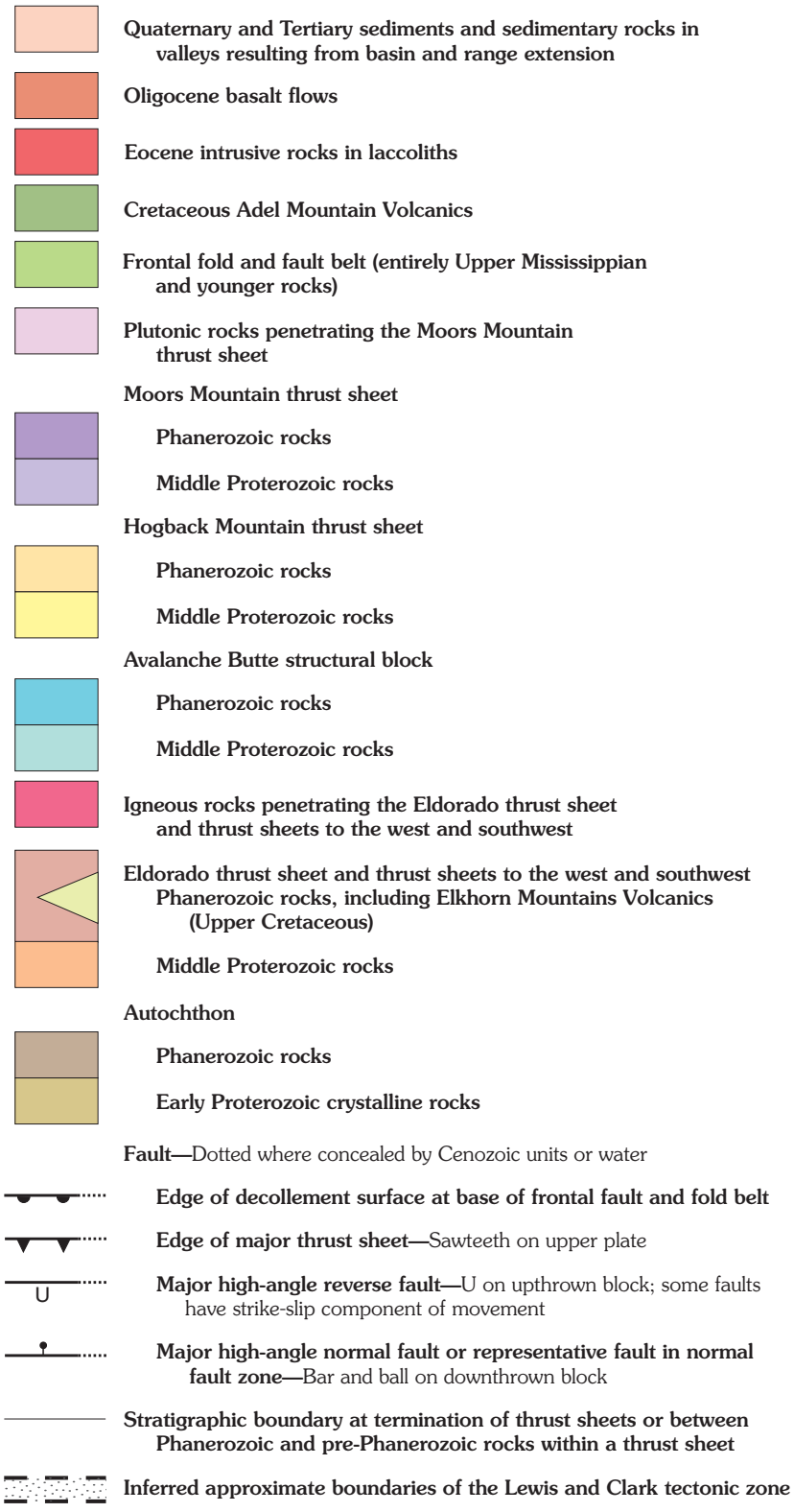
EXAMPLE OF FULL PAGE-SIZE MAP (Corresponding explanation on following page)



EXAMPLE OF FULL PAGE-SIZE MAP EXPLANATION (Corresponding map on previous page)

EXPLANATION

[Thrust sheets and igneous units listed in descending succession of inferred increasing age; some Quaternary and Tertiary deposits are not shown]



Quaternary and Tertiary sediments and sedimentary rocks in valleys resulting from basin and range extension

Oligocene basalt flows

Eocene intrusive rocks in laccoliths

Cretaceous Adel Mountain Volcanics

Frontal fold and fault belt (entirely Upper Mississippian and younger rocks)

Plutonic rocks penetrating the Moors Mountain thrust sheet

Moors Mountain thrust sheet

Phanerozoic rocks

Middle Proterozoic rocks

Hogback Mountain thrust sheet

Phanerozoic rocks

Middle Proterozoic rocks

Avalanche Butte structural block

Phanerozoic rocks

Middle Proterozoic rocks

Igneous rocks penetrating the Eldorado thrust sheet and thrust sheets to the west and southwest

Eldorado thrust sheet and thrust sheets to the west and southwest

Phanerozoic rocks, including Elkhorn Mountains Volcanics (Upper Cretaceous)

Middle Proterozoic rocks

Autochthon

Phanerozoic rocks

Early Proterozoic crystalline rocks

Fault—Dotted where concealed by Cenozoic units or water

Edge of decollement surface at base of frontal fault and fold belt

Edge of major thrust sheet—Sawteeth on upper plate

U

Major high-angle reverse fault—U on upthrown block; some faults have strike-slip component of movement

Major high-angle normal fault or representative fault in normal fault zone—Bar and ball on downthrown block

Stratigraphic boundary at termination of thrust sheets or between Phanerozoic and pre-Phanerozoic rocks within a thrust sheet

Inferred approximate boundaries of the Lewis and Clark tectonic zone

GRAPHS AND DIAGRAMS

① Graphs and diagrams may include line graphs, pie diagrams, scatter plots, and bar graphs. The outer enclosing graph frame should be a lineweight of 0.36 point (0.005 inch), solid black line. Corresponding tick marks should be the same lineweight as the enclosing frame.

② Always place tick marks inside the graph frame. Placement of tick marks is varies greatly. Most graphs and diagrams have ticks on two sides, but there are cases of ticks on 3 or 4 sides, as well. Rarely will a graph have no tick marks. Numbered tick marks should use a tick length of 0.075 inch, intermediate (unnumbered) ticks should use a tick length of 0.05 inch. Lettering of tick marks is Universe Light Condensed, 7 or 8 point depending on size of graph. Axes labeled in Universe Roman Caps, 7 or 8 point.

③ Graph explanation may be placed inside or outside the frame. Always use the word EXPLANATION. Standard explanation format is used. Not shown here.

④ Lettering inside graph is Universe Roman, 7 or 8 point (depending on size of graph), upper and lowercase.

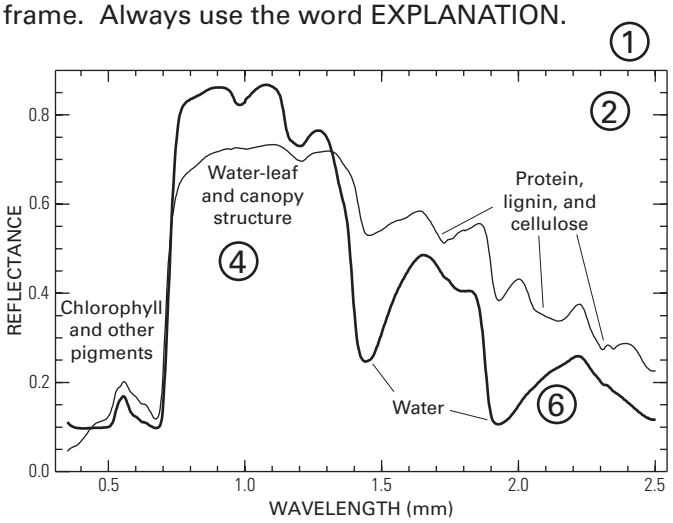
⑤ Multiple graphs will be stacked and labeled ***A***, ***B***, and ***C***, inside of graph at lower left corner, or outside graph at lower left bottom of frame. Use Souvenir Medium Italic, 11 point type.

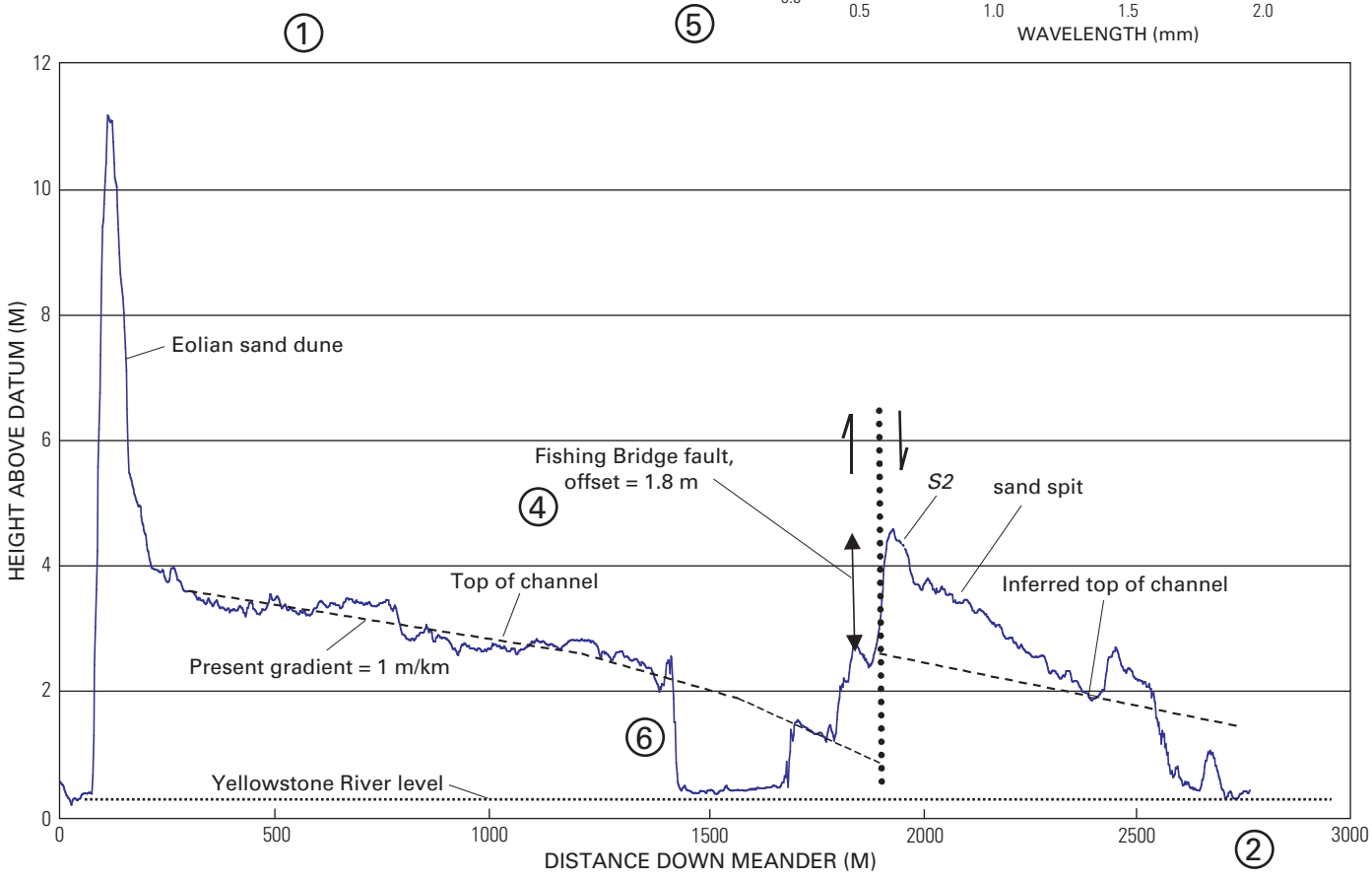
⑥ Lineweights inside graph frame can be 0.5 to 1.0 point. If using dots, select size on visual basis.

Graph *A*

Graph *B*

Graph *C*





COMMON LINEWEIGHTS

LINEWEIGHT USAGE	INCHES	POINTS
City or town boundary lines	0.008	0.576
Coast line (100% cyan)	0.007	0.504
Contacts	0.006	0.432
Continental Divide	0.012	0.864
County boundary lines	0.010	0.720
Cross section lines	0.008	0.576
Dike	0.008	0.576
Drainage basin boundary	0.020	1.440
Drainage (intermittent) (100% cyan)	0.008	0.576
Drainage (perennial) (100% cyan)	0.008	0.576
Explanation boxes	0.005	0.360
Faults	0.015	1.080
Folds (anticline, syncline, monocline) (100% Mag)	0.010	0.720
Grid lines (graphic frame box)	0.005	0.360
International boundary lines	0.016	1.152
Latitude and longitude ticks	0.005	0.360
Location maps	0.005	0.360
Magnetic contours (index) (100% red)	0.015	1.080
Magnetic contours (intermediate) (100% red)	0.011	0.792
Neatlines (figures)	0.005	0.360
Park boundary lines	0.010	0.720
Province boundary lines	0.020	1.440
Rake scale	0.006	0.432
Roads (two-lane)	0.008	0.576
Roads (dual highway, interstate)	0.022 (6-10-6) (for each lane)	1.584
Strike and dip	0.006	0.432
State boundary lines	0.012	0.864
Structure contours (index) (100% red)	0.015	1.080
Structure contours (intermediate) (100% red)	0.011	0.792
Town circles	0.006	0.432
Township and range lines	0.010	0.720

COMMON LINEWEIGHT DASHING

	Lineweight	Dash	Gap	Dash	Gap	Dash	Gap	
International boundary	1.15	14	2.2	5	2.2	5	2.2	**Points**
	0.016	0.2	0.03	0.07	0.03	0.07	0.03	**Inches**
State boundary	0.864	14	2.2	5	2.2	5	2.2	**Points**
	0.012	0.2	0.03	0.07	0.03	0.07	0.03	**Inches**
County boundary	0.72	8.5	2.2	4.2	2.2			**Points**
	0.01	0.12	0.03	0.06	0.03			**Inches**
National Park boundary	0.72	10	2.9	1.1	2.9			**Points**
	0.01	0.14	0.04	0.02	0.04			**Inches**
Approximately located	variable	10	2.9					**Points**
		0.14	0.04					**Inches**
Inferred	variable	4.2	2.9					**Points**
		0.06	0.04					**Inches**
Concealed	variable	1.44	1.44					**Points**
		0.02	0.02					**Inches**

GEOLOGIC FORMATION SYMBOLS AND SPECIAL KEY STROKES

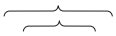
LETTER SYMBOLS FOR GEOLOGIC ERA, SYSTEM, AND PERIOD
(derived from Universal Pi Variant font)

Archean	A	Permian	P
Cenozoic	Cz	Carboniferous	C
Mesozoic	Mz	Pennsylvanian	IP
Paleozoic	Pz	Mississippian	M
Proterozoic	P	Devonian	D
Quaternary	Q	Silurian	S
Tertiary	T	Ordovician	O
Cretaceous	K	Cambrian	€
Jurassic	J	Precambrian	p€
Triassic	Tr		

KEY STROKES FOR SPECIAL LETTERS

Em dash	Shift-Option-Hyphen	—
En dash	Option-Hyphen	–
Degree symbol	Option-Shift-8	°
Minute symbol	Option-4 (Symbol font)	′
Second symbol	Option-comma (Symbol font)	″
Multiple sign	Option-y (Symbol font)	×

CARTOGRAPHIC SYMBOLS

DESCRIPTION	SYMBOL
Fault	
Fault with bar and ball	
Oblique-slip and (or) strike-slip fault	
Thrust fault	
Fault movement arrows	
Anticline	
Syncline	
Overturned anticline	
Overturned syncline	
Monocline	
Town circle	
Stream	
Unconformity	
Query	?
Brackets	
Bar and ball	
Inclined bedding	
Vertical bedding	
Overturned bedding	
Horizontal bedding	
Inclined foliation	
US highway symbol	
State highway symbol	
Interstate highway symbol	
North arrow	

CONVERSION CHART

INCHES	POINTS	MILLIMETERS	
0.001	0.072	0.025	12 points = 1 pica
0.002	0.144	0.051	72 points = 1 inch
0.003	0.216	0.076	6 picas = 1 inch
0.004	0.288	0.102	
0.005	**0.360**	**0.127**	1 inch = 2.54 centimeters
0.006	0.432	0.152	1 inch = 25.4 millimeters
0.007	0.504	0.178	
0.008	0.576	0.203	1 foot = 0.3048 meter
0.009	0.648	0.229	
0.010	**0.720**	**0.254**	1 mile = 1609.3 meters
0.011	0.792	0.279	1 mile = 1.6093 kilometers
0.012	0.864	0.305	
0.013	0.936	0.330	1 meter = 3.2808 feet
0.014	1.008	0.356	
0.015	**1.080**	**0.381**	1 kilometer = 0.62137 mile
0.016	1.152	0.406	
0.017	1.224	0.432	
0.018	1.296	0.457	
0.019	1.368	0.483	
0.020	**1.440**	**0.508**	
0.025	1.800	0.635	
0.030	2.160	0.762	
0.035	2.520	0.889	
0.040	2.880	1.016	
0.045	**3.240**	**1.143**	
0.050	3.600	1.270	
0.055	3.960	1.397	
0.060	4.320	1.524	
0.065	4.680	1.651	
0.070	5.040	1.778	

TYPE REQUIREMENTS

ITEM	FONT TYPE	FONT SIZE	REMARKS
Base credit note	ULC	7	Caps and lowercase
City names	SL	7	Caps and lowercase
Contour values	UI	7	No comman in 4 digit nos.
Country names	SM	9	Caps
County names	SM	7	Caps
Dam names	UI	7	Caps
Drainage features (Major)	SLI	7	Caps
Drainage features (Minor)	SLI	7	Caps and lowercase
Fault names	U	7	Caps and lowercase
Fold names (Anti, Syn, Monoclines)	U	7	Caps and lowercase
Gas and oil field	U	7	Caps and lowercase
General information	U	7/8	Caps and lowercase
Geographic Coordinates (lat & long)	ULC	7	
Geologic features (Major)	U	7/8	Caps
Geologic features (Minor)	U	7	Caps and lowercase
Geologic credit note	ULC	7	Caps and lowercase
Geologic (Formation) names	U	7/8	Caps and lowercase
Headings on X-Y axes	U	7/8	Caps
Location map state name	SM	7	Caps
Map quadrangle location	ULC	7	Caps
Mine names	UBCI	7	Caps and lowercase
Mining district names	U	7/8	Caps
National park names	SM	7	Caps
North/South/East/West	U	7	Caps (abbrev. U-9 Caps)
Province boundary names	U	7	Caps
Railroad names	UI	7	Caps
Rake scale numbers	ULC	7	No comma in 4-digit nos.
Road (highway) names	UI	7	Caps
State capitol names	SL	7	Caps
State names	SM	8	Caps
State park names	SM	7	Caps
Study area	SL	7	Caps and lowercase
Town names	SL	7	Caps and lowercase
Township/Range values	ULC	7	Caps (T. 137 N.) (R. 13 E.)

TYPE REQUIREMENTS

CROSS SECTION ITEM	FONT TYPE	FONT SIZE	REMARKS
Bend in section note	ULC	7	Caps
Cross section designation	SMI	11	Caps
Drill hole identification/information	UI	7	Caps
Fault names	U	7	Caps
Geologic formation symbols	U	7	Caps and lowercase
Geographic features	U	7	Caps and lowercase
Geologic features	U	7	Caps
Hydrologic features	SLI	7	Caps
Meters and feet designation	ULC	7	Caps
Elevation (scale) numbers	ULC	7	Caps
East, West, North, South headings	U	7	Caps
Sea level	ULC	7	Caps
Vertical exaggeration note	ULC	7	Caps

STRATIGRAPHIC COLUMN ITEM	FONT TYPE	FONT SIZE	REMARKS
Formation names	U	8	Caps and lowercase
Member names	U	8	Caps and lowercase
Fossil names	SLI	7	Caps and lowercase
Group names	U	8	Caps and lowercase
Headings	U	8	Caps
Sequence names	U	9	Caps
Series names	U	9	Caps and lowercase
Era/System/Period names	U	9	Caps
Thickness	U	7	Caps and lowercase
Unconformities	SL	7	Caps

FOSSIL PLATE ITEM	FONT TYPE	FONT SIZE	REMARKS
Fossil names within plate title	SLI	9	Caps
Identification number/letter of fossil	U	10/12	Caps
Plate title	SL	9	Caps

MISCELLANEOUS ITEMS

Mount	Mt
Mountain	Mtn
Mountains	Mts

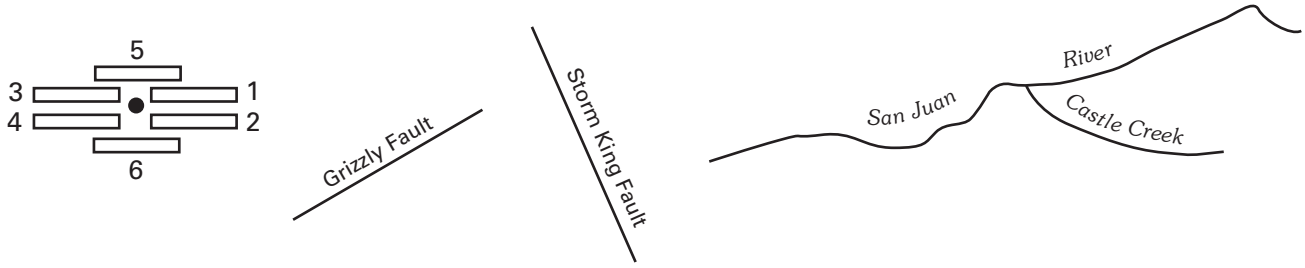
No north arrow is needed when latitudes and longitudes are given

TYPE REQUIREMENTS

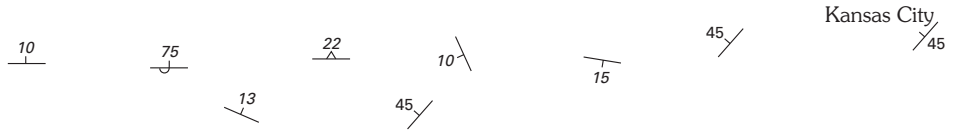
PLACEMENT OF TYPE ON PAGE-SIZE MAPS

A map is usually read with north at the top. Therefore, most names and labels should be positioned parallel to the bottom neatline. The exception to horizontal lettering is the labeling of diagonal linear features such as faults, folds, anticlines, streams, and roads. Labels on diagonal features should read from south to north, but should not appear to be tipped over backwards. Labels on linear features should be positioned along an imaginary smooth line even where the feature is extremely crooked.

Preferred type placement for labeling small features or symbols is to the upper right, or as listed in preference in the diagram below. Avoid type alignment where the symbol could be read into the lettering.



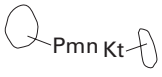
Strike and dip values should be placed so that the dip points to an imaginary dot in the center of the number. Dip values may be placed on the back side of the symbol when placement on the dip side would interfere with other map detail or it would have to be placed too far from the symbol on the dip side.



Leaders should cross the contact at nearly right angles. Leaders should be placed vertically or horizontally only when it is not possible to leader from an angle. One-third of the leader should be inside the area being labeled, unless a long leader must be used. Long leaders should be avoided but may be necessary. Avoid "back-leadering." Avoid leadering into a lined patteern in such a way that the leader runs the same direction as the pattern. Avoid the use of multiple leaders, especially with multicolor illustrations. Consider the color contrast between the areas being labeled and the surrounding area. If the contrast is easily distinguishable it is not necessary to label each area. If there is little or no contrast between areas, additional formation symbols are preferred to additional leaders unless it would overcrowd the area.

Examples of back-leadering and leadering into a lined pattern.

Do not place lettering so it can be mistakenly read into the label of another feature. Always check against other layers and base type.

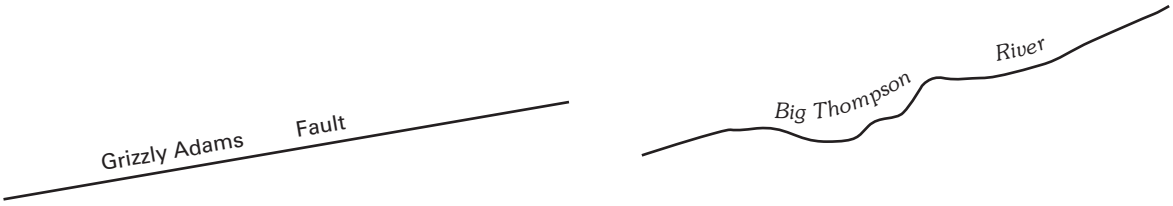


TYPE REQUIREMENTS

PLACEMENT OF TYPE ON PAGE-SIZE MAPS

Spacing between letters in the name of a feature should not exceed four times the individual letter height. It is desirable to increase the spacing between letters of a ridge or valley name (or other long feature) that is too short to properly identify the feature.

Spacing between words in the name of a feature should not be so great that their relationship is not immediately evident at a glance. On a long feature it is preferable to repeat the name rather than overspread the letters. Words in a name are spaced equally unless there is a relationship between certain components. Less space should be allowed between related words than between words that are not related.

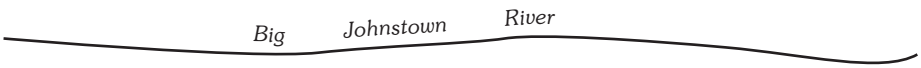


The relationship between components should be maintained when it is necessary to place the name on two lines.

Crown Hill Lake	**NOT**	Crown Hill Lake

The significance of the words must be considered in proper placement of type.

The name of this river is "Big Johnstown"



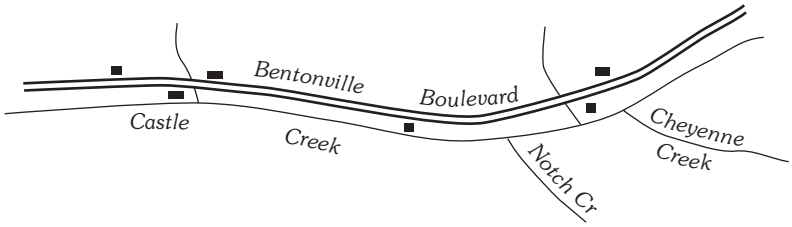
The name of this river is "Johnstown." The placement of type implies that there are two Johnstown rivers, this one being the larger.

TYPE REQUIREMENTS

PLACEMENT OF TYPE ON PAGE-SIZE MAPS

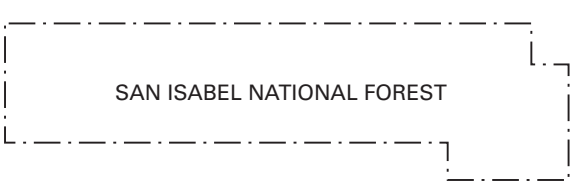
The name of a stream shown as open water is placed within the open water area of the feature when space permits. Type must be placed entirely within or entirely outside the shoreline of a stream. Placement above the stream is preferred to placement below the stream.

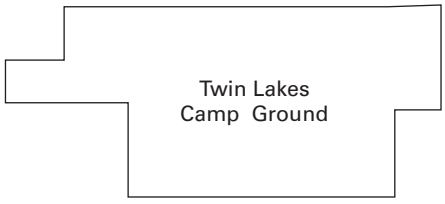
If it is necessary to label a feature on the underside, all components of the name should be placed on the underside. If it is especially important that a short stream segment be labeled, it is permissible, as a last resort, to place part of the name above the line and the remaining part below the line.

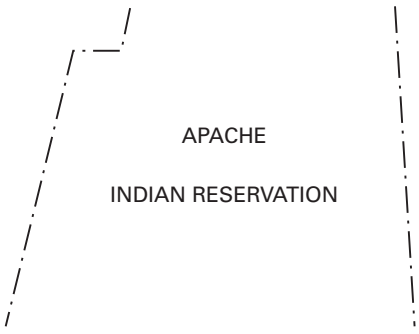


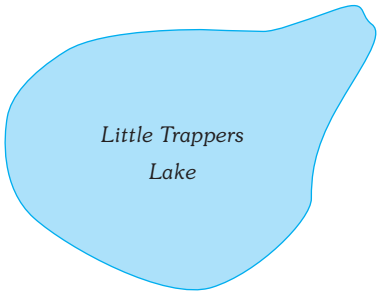
The words River and Creek may only be abbreviated as a last resort. Do NOT show periods if forced to abbreviate.

In labeling areal features (National forests, Indian reservations, lakes), place the label within the feature boundaries, preferably centered, and in one line. Two or more lines may be placed in two lines if necessary; lettering should not be split into three lines except as a last resort.









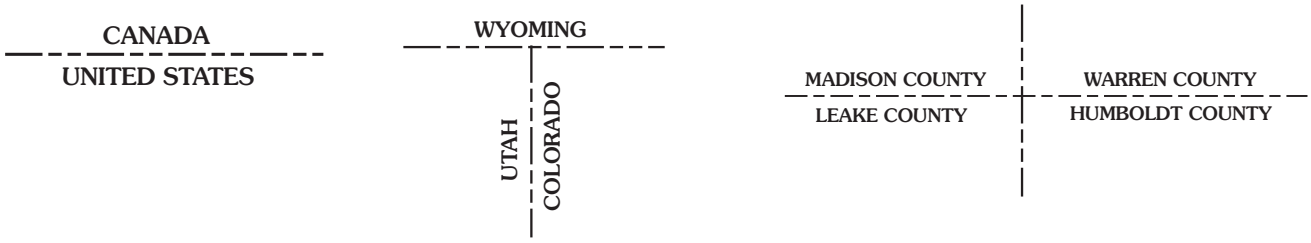
TYPE REQUIREMENTS

PLACEMENT OF TYPE ON PAGE-SIZE MAPS

When placing two or more lines of type to the side of a feature, align the type vertically on the side next to the feature. When placing two or more lines of type above or below the feature, center the second line on the first.

For simplicity and uniformity, and because it is not good practice to use any mark that could be mistaken for a map symbol, most punctuation marks are omitted from the body of a map. The period is not shown, and the apostrophe is rarely used to indicate possession. Harpers Ferry and Pikes Peak Syncline are the correct map forms, not Harper's Ferry or Pike's Peak Syncline. The apostrophe is used only when it is part of the name, such as O'Brien Creek.

When names of States and counties are placed along and parallel to boundary lines, they are centered one over the other whenever practicable.



Names of large cities, civil townships, forests, parks, and reservations are normally placed horizontally and near the center of the feature. The names of small towns, villages, and places are placed horizontally and, wherever practicable, to the right of the feature.

Names of small features, such as mountain peaks, hills, gaps, and passes, should be placed to the right of their highest point. The name of a long, narrow mountain or ridge should be placed slightly to the north of the axis of the feature, clear of the highest contour lines, and aligned on the general trend of the feature. The names of narrow valleys, canyons, or gorges are placed on the north side following the general trend of the feature.